Laplace Transforms – Practice Problems

1. Compute Transforms Directly
   a. t^2
   b. e^{-5t}
   c. $\sin at$
   d. $\sinh 3t$
2. Use Properties and Basic Transforms
   a. Find Laplace Transform
      i. $\sin(5t+2)$
      ii. $t^2 e^t$
      iii. $e^{-t}\sin 2t$
      iv. $t\sin t$
      v. $tH(t-1)$
      vi. $\sin t \cdot H(t-\frac{\pi}{2})$
      vii. $\int_0^t e^{-(t-u)}\cos 2u du$
   b. Find Inverse Laplace Transform
      i. $\frac{s-2}{s^2-2}$
      ii. $\frac{s-2}{s^2+3}$
      iii. $\frac{2s-1}{s^2+2s+8}$
      iv. $\frac{e^{-\pi s}}{1+s^2}$
      v. $\frac{3}{s(s^2+4)}$
3. Solve the initial value problems
   a. $y''-2y'-3y=5,\ y(0)=0,\ y'(0)=1$
   b. $y''+2y'+5y=0,\ y(0)=1,\ y'(0)=1$
   c. $y''+9y=\sin 3t,\ y(0)=1,\ y'(0)=0$
   d. $y''-4y'+13y=\delta(t-1),\ y(0)=0,\ y'(0)=3$